

UNIV-1100 — First Year Seminar: Scientific Computing Learning Community

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Python

Python - Is a remarkably powerful dynamic programming language that is used in a wide variety of application domains.

<http://www.python.org/about>

Python lines - Guido van Rossum (the original creator of the Python language) decided to clean up Python 2.x properly, hence Python 3.x

<http://wiki.python.org/moin/Python2orPython3>

- Python 2.x - Python 2.x is the status quo. The final 2.7 version was released in 2010 (with a statement of extended support for this end-of-life release), version 2.7.2 was released in 2011.
- Python 3.x - Python 3.x is the present and future of the language. The current version is 3.2.2, was released in 2011.

Computer Languages

- Compiled Languages - Fortran, C, C++
workflow:
 - write source code
 - compile into object
 - link into an executable
 - run
- Interpreted Languages - Java, Python, Matlab
workflow:
 - write source code, script
 - run in interpreter, can also run commands interactively in an interpreter

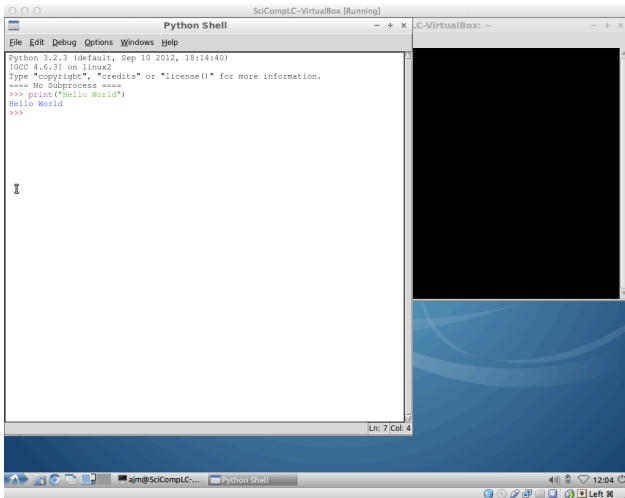
Integrated Development Environment - IDE

IDE - Integrated Development Environment

- source code editor
- compiler or interpreter
- tools (class browser, workspace browser, variable editor, debugger)
- version control system
- debugger
- build automation tools

Integrated Development Environment - IDE

IDLE - Python IDE



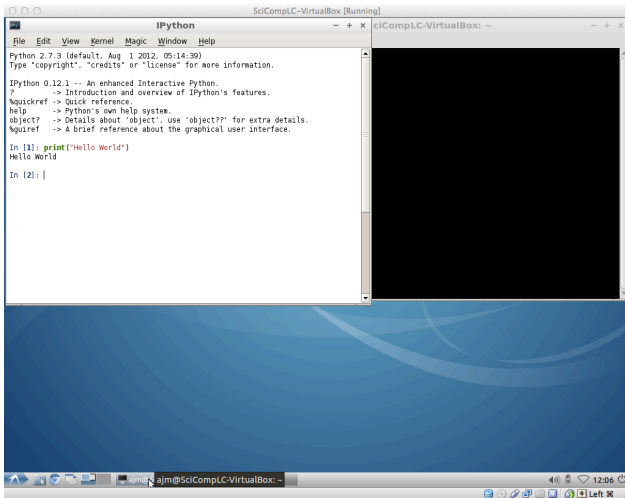
The screenshot shows a window titled "SciCompLC-VirtualBox [Running]" containing a "Python Shell" window. The Python Shell window has a menu bar with "File", "Edit", "Debug", "Options", "Windows", and "Help". The main text area contains the following text:

```
Python 3.2.3 (default, Sep 10 2012, 18:14:40)
[GCC 4.6.3] on linux2
Type "copyright", "credits" or "license()" for more information.
==== No Subprocess ====
>>> print("Hello World")
Hello World
>>>
```

The cursor is positioned at the end of the last line. The status bar at the bottom of the Python Shell window shows "Ln: 7, Col: 4". The background of the virtual machine is a blue desktop environment. The system tray at the bottom of the window shows the user "ajm@SciCompLC...", the application "Python Shell", and the time "12:04".

Integrated Development Environment - IDE

iPython Qt



```
Python 2.7.3 (default, Aug 1 2012, 05:14:39)
Type 'copyright', 'credits' or 'license' for more information.

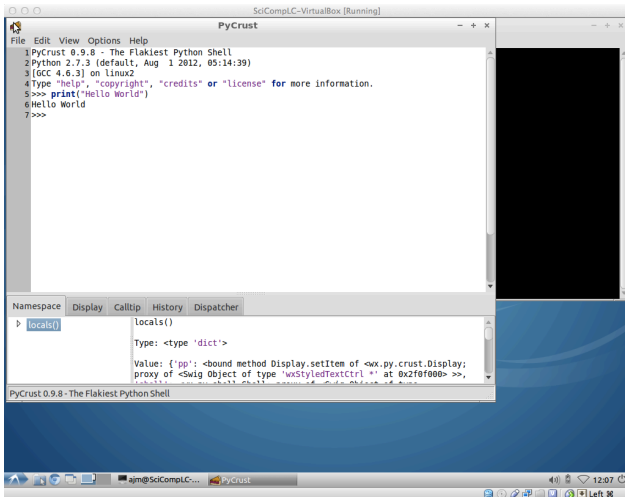
IPython 0.12.1 -- An enhanced Interactive Python.
?                -> Introduction and overview of IPython's features.
%quickref        -> Quick reference.
help             -> Python's own help system.
object?         -> Details about 'object', use 'object??' for extra details.
%quickref       -> A brief reference about the graphical user interface.

In [1]: print("Hello World")
Hello World

In [2]: |
```

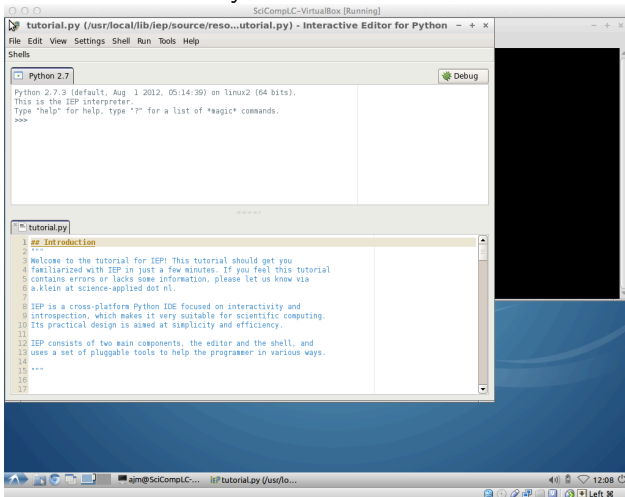
Integrated Development Environment - IDE

PyCrust



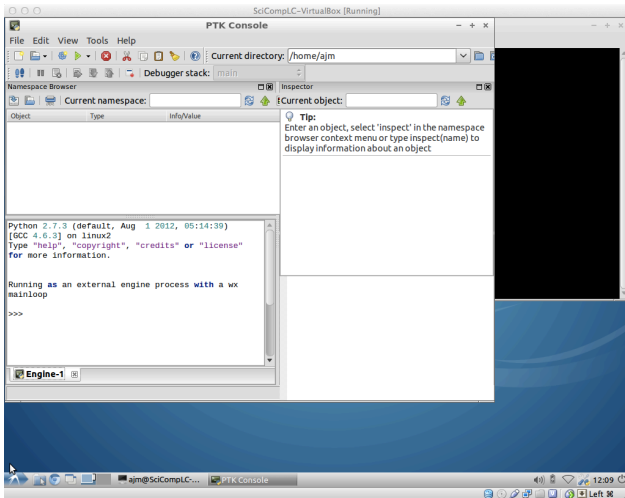
Python - IDE

IEP - Interactive Editor for Python



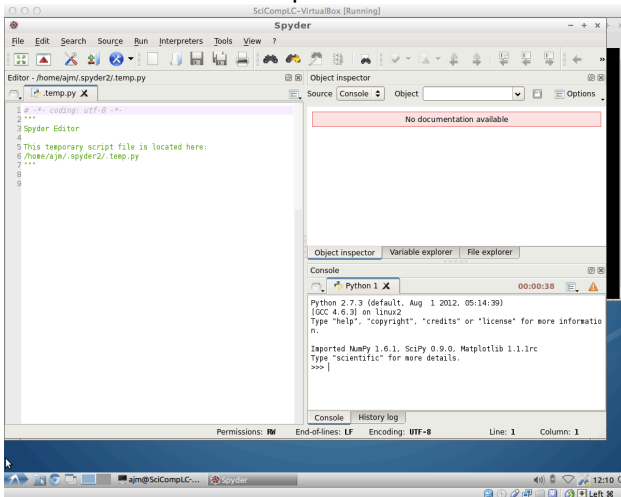
Python - IDE

PTK - Python Toolkit



Python - IDE

Spyder - Scientific PYthon Development EnviRonment



Mathematical Formula

Describes the height of an object in vertical motion (thrown upwards from height zero with a given initial velocity).

$$y(t) = v_0 t - \frac{1}{2} g t^2$$

y - height

v_0 - initial velocity

g - acceleration of gravity

t - time

Mathematical Formula

We can evaluate the formula for given parameter values

$$y(t) = v_0 t - \frac{1}{2} g t^2$$

given the values

$$v_0 = 5$$

$$g = 9.81$$

$$t = 0.6$$

calculate

$$y = 5 \cdot 0.6 - \frac{1}{2} \cdot 9.81 \cdot 0.6^2$$

Python commands

```
5 * 0.6 - 1.0/2.0 * 9.81 * 0.6 ** 2
```

Mathematical Formula

We can write a one-line program

$$y(t) = v_0 t - \frac{1}{2} g t^2$$

given the values

$$v_0 = 5$$

$$g = 9.81$$

$$t = 0.6$$

calculate

$$y = 5 \cdot 0.6 - \frac{1}{2} \cdot 9.81 \cdot 0.6^2$$

Python commands

```
print 5 * 0.6 - 1.0/2.0 * 9.81 * 0.6 ** 2
```

Mathematical Formula

Consider the mathematical formula

$$y(t) = v_0 t - \frac{1}{2} g t^2$$

calculate

$$y = 5 \cdot 0.6 - \frac{1}{2} \cdot 9.81 \cdot 0.6^2$$

A simple Python script

```
v_0 = 5  
g = 9.81  
t = 0.6  
y = v_0*t - 1.0/2.0*g*t**2  
print y
```